SIRENZA MICRODEVICES

Preliminary

SGA-1163

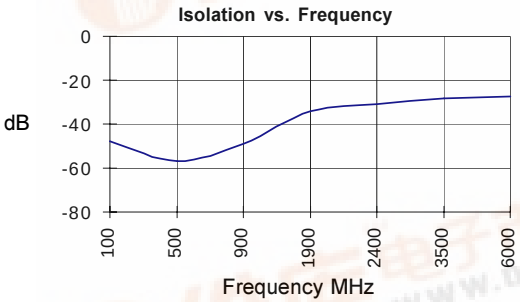
DC-6000 MHz Silicon Germanium HBT Cascadeable Gain Block

Product Description

Sirenza Microdevices' SGA-1163 is a Silicon Germanium HBT Heterostructure Bipolar Transistor (SiGe HBT) amplifier that offers excellent isolation and flat gain response for applications to 6 GHz.

This RFIC is a 2-stage design that provides high isolation of up to 40dB at 2 GHz and is fabricated using the latest SiGe HBT 50 GHz F_T process, featuring 1 micron emitters with Vceo > 7V.

These unconditionally stable amplifiers have less than 1dB gain drift over 125ºC operating range (-40C to +85C) and are ideal for use as buffer amplifiers in oscillator applications covering cellular, ISM and narrowband PCS bands.



Product Features

- DC-6000 MHz Operation
- Excellent Isolation, >50 dB at 900 MHz
- Single Supply Voltage
- Unconditionally Stable
- 50 Ohms In/Out, Broadband Match for Operation from DC - 6 GHz

Applications

- Buffer Amplifier for Oscillator Applications
- Broadband, High Isolation

Symbol	Parameters: Test Conditions: Z_0 = 50 Ohms, Id = 12 mA, T = 25ºC		Units	Min.	Typ.	Max.
P_{1dB}	Output Power at 1dB Compression	f = 850 MHz f = 1950 MHz	dBm dBm		-3.3 -4.6	
S_{21}	Small Signal Gain	f = DC - 1000 MHz f = 1000 - 2000 MHz f = 2000 - 6000 MHz	dB dB dB	10.5	11.7 11.2 9.5	
S_{12}	Reverse Isolation	f = DC - 1000 MHz f = 1000 - 2000 MHz f = 2000 - 6000 MHz	dB dB dB		53.3 38.3 28.5	
S_{11}	Input VSWR	f = DC - 2400 MHz f = 2400 - 6000 MHz	-		1.3:1 1.8:1	
S_{22}	Output VSWR	f = DC - 2400 MHz f = 2400 - 6000 MHz	-		2.1:1 2.2:1	
IP_3	Third Order Intercept Point Power out per Tone = -20 dBm	f = 850 MHz f = 1950 MHz	dBm dBm		7.9 6.3	
NF	Noise Figure	f = DC - 1000 MHz f = 1000 - 2400 MHz	dB dB		3.1 3.4	
T_D	Group Delay	f = 1000 MHz	pS		118	
V_D	Device Operating Voltage		V	4.2	4.6	5.0
I_D	Device Operating Current		mA	10	12	14

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SGA-1163 DC-6000 MHz 4.6V SiGe Amplifier

Parameter	Specification				Test Condition
	Min	Typ.	Max.	Unit	
Bandwidth					T= 25C
Frequency Range	DC		6000	MHz	
Device Bias					T= 25C
Operating Voltage		4.6		V	
Operating Current		12		mA	
500 MHz					T= 25C
Gain		11.8		dB	
Noise Figure		3.1		dB	
Output IP3		8.7		dBm	
Output P1dB		-3.8		dBm	
Input Return Loss		31.9		dB	
Isolation		62.3		dB	
850 MHz					T= 25C
Gain		11.5		dB	
Noise Figure		3.1		dB	
Output IP3		7.9		dBm	
Output P1dB		-3.3		dBm	
Input Return Loss		33.1		dB	
Isolation		47.6		dB	
1950 MHz					T= 25C
Gain		11.2		dB	
Noise Figure		3.4		dB	
Output IP3		6.3		dBm	
Output P1dB		-4.6		dBm	
Input Return Loss		15.7		dB	
Isolation		34.3		dB	
2400 MHz					T= 25C
Gain		11.4		dB	
Noise Figure		3.4		dB	
Output IP3		5.7		dBm	
Output P1dB		-4.4		dBm	
Input Return Loss		17.8		dB	
Isolation		30.2		dB	

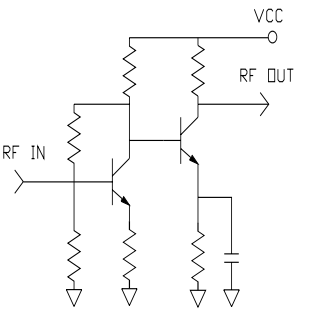
Absolute Maximum Ratings

Parameter	Absolute Limit
Max. Device Current (I_D)	24 mA
Max. Device Voltage (V_D)	6 V
Max. RF Input Power	-9 dBm
Max. Junction Temp. (T_J)	+150°C
Operating Temp. Range (T_L)	-40°C to +85°C
Max. Storage Temp.	+150°C

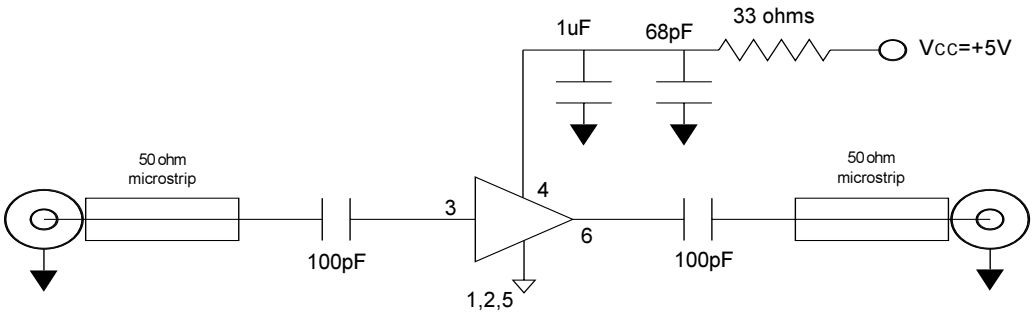
Operation of this device beyond any one of these limits may cause permanent damage. For reliable continous operation, the device voltage and current must not exceed the maximum operating values specified in the table on page one.

Bias conditions should also satisfy the following expression:

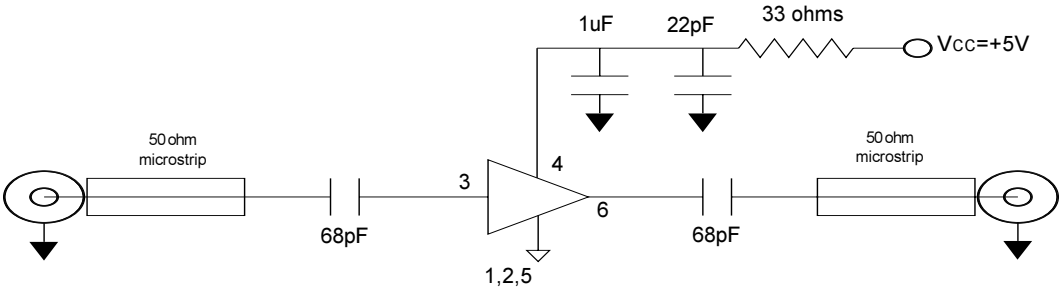
$$I_D V_D < (T_J - T_L) / R_{TH, j-l}$$

Pin #	Function	Description	Device Schematic
1	GND	Connection to ground. Use via holes for best performance to reduce lead inductance as close to ground leads as possible.	
2	GND	Sames as Pin 1	
3	RF IN	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.	
4	Vcc	Supply connection. This pin should be bypassed with a suitable capacitor(s).	
5	GND	Sames as Pin 1	
6	RF OUT	RF output and bias pin. DC voltage is present on this pin, therefore a DC blocking capacitor is necessary for proper operation.	

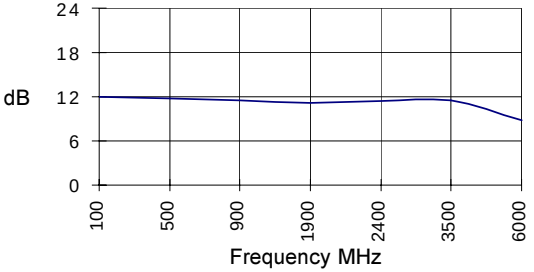
Application Schematic for +5V Operation at 900 MHz



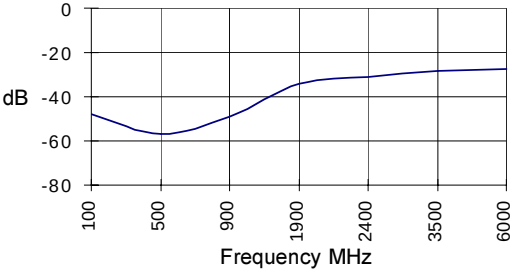
Application Schematic for +5V Operation at 1900 MHz



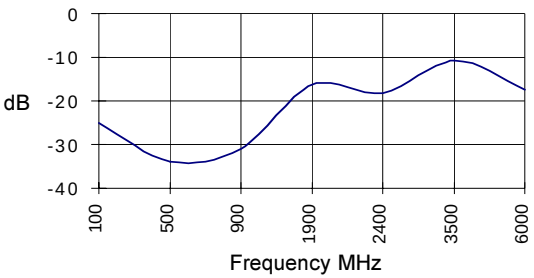
S21, Id =12mA, T=+25C



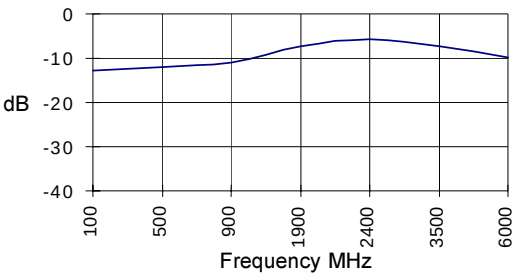
S12, Id =12mA, T=+25C



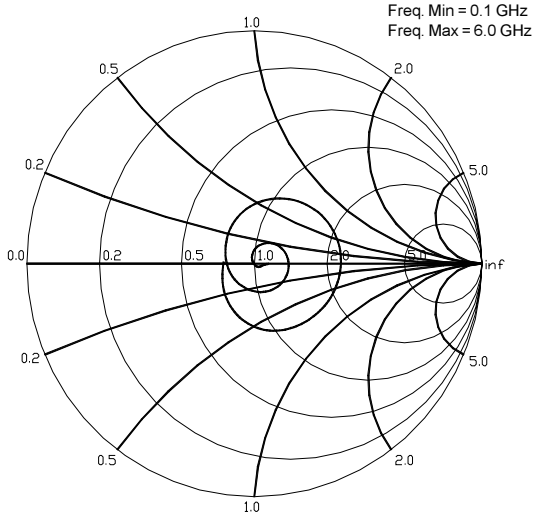
S11, Id =12mA, T=+25C



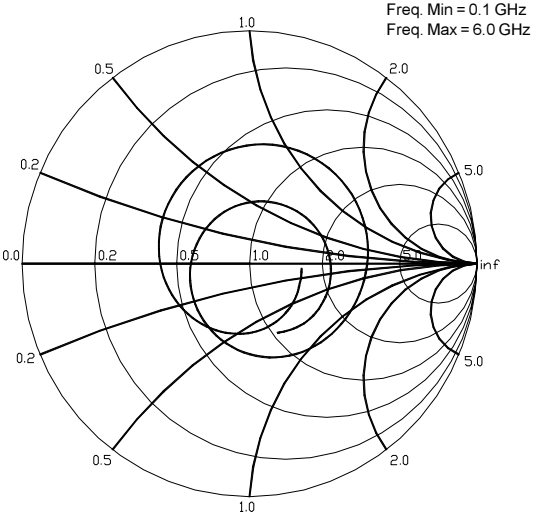
S22, Id =12mA, T=+25C



S11, Id=12mA, Ta= +25C



S22, Id=12mA, Ta= +25C



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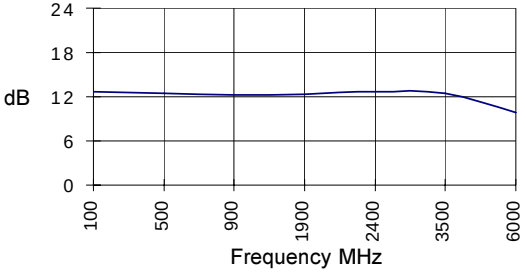
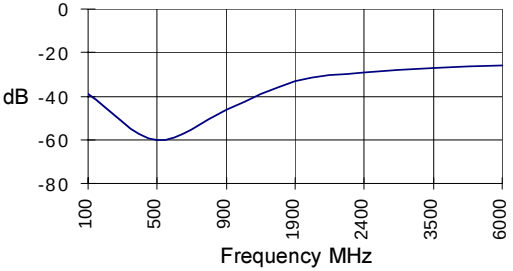
SGA-1163 DC-6000 MHz 4.6V SiGe Amplifier

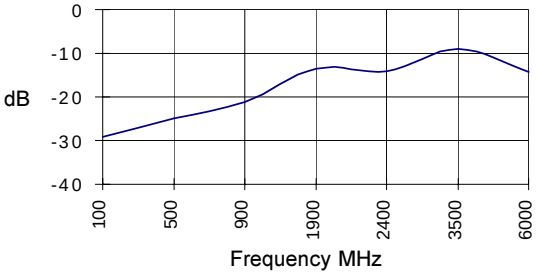
S21, Id =12mA, T=-40C



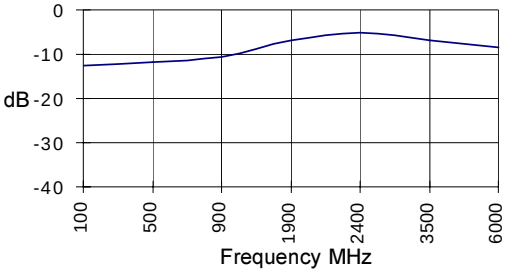
S12, Id =12mA, T=-40C



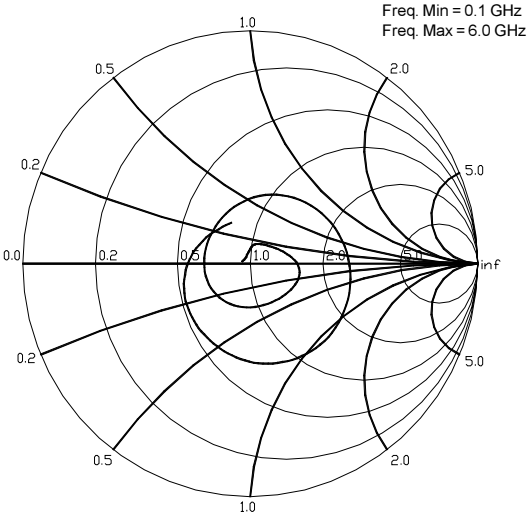
S11, Id =12mA, T=-40C



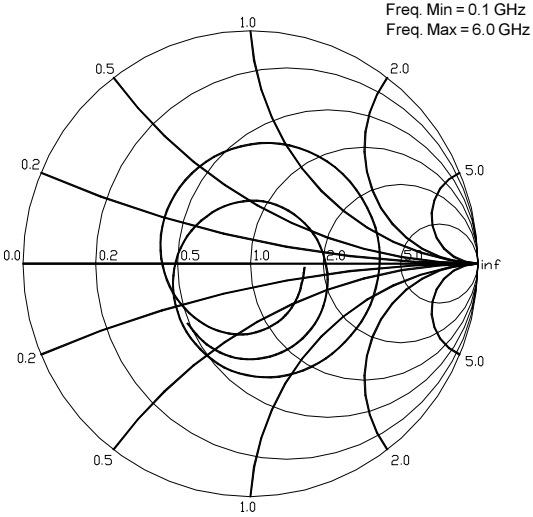
S22, Id =12mA, T=-40C



S11, Id=12mA, T=-40C



S22, Id=12mA, T=-40C



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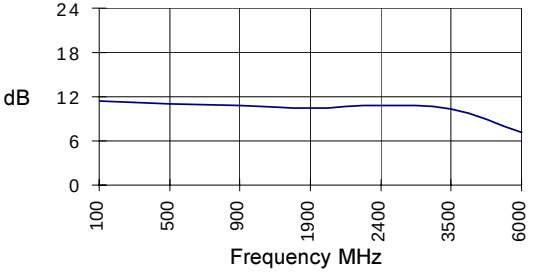
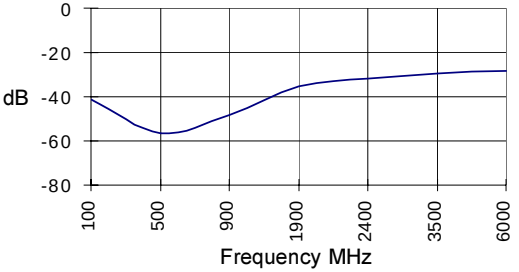
SGA-1163 DC-6000 MHz 4.6V SiGe Amplifier

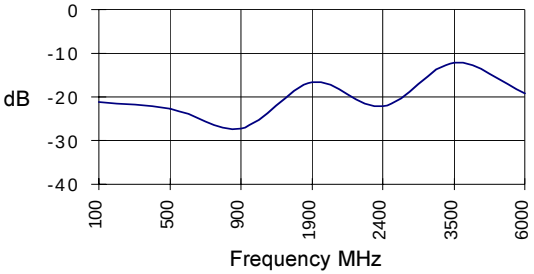
S21, Id =12mA, T=+85C



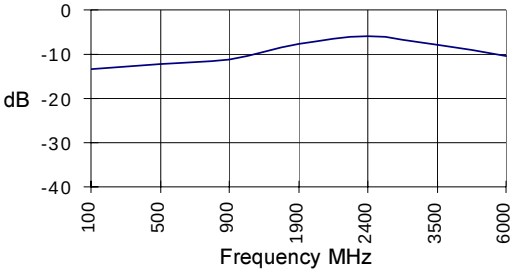
S12, Id =12mA, T=+85C



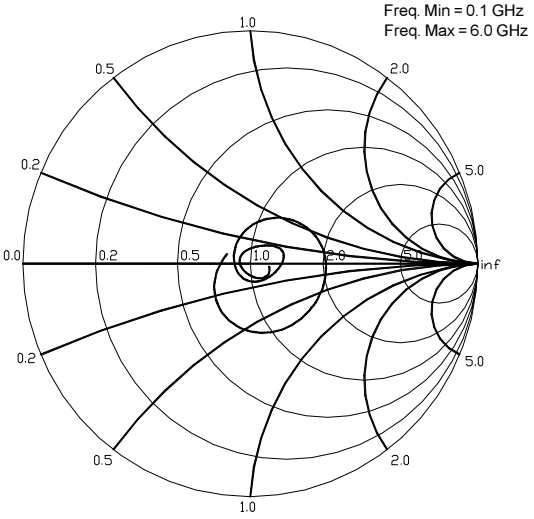
S11, Id =12mA, T=+85C



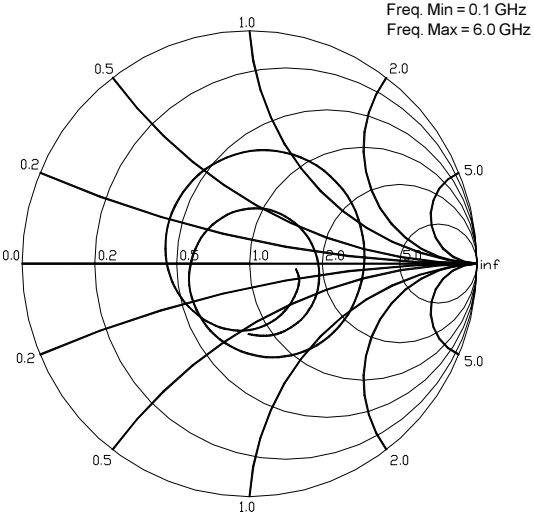
S22, Id =12mA, T=+85C



S11, Id=12mA, T=+85C



S22, Id=12mA, T=+85C



SGA-1163 DC-6000 MHz 4.6V SiGe Amplifier

Absolute Maximum Ratings

Caution:
Operation of this device above any one of these parameters may cause permanent damage. Appropriate precautions in handling, packaging and testing devices must be observed.

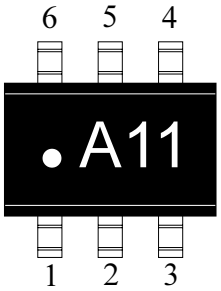
Thermal Resistance (Lead-Junction):
255° C/W

Part Number Ordering Information

Part Number	Reel Size	Devices/Reel
SGA-1163-TR1	7"	3000

Recommended Bias Resistor Values					
Supply Voltage(Vs)	5V	6V	7.5V	9V	12V
Rbias (Ohms)	33	117	242	367	617

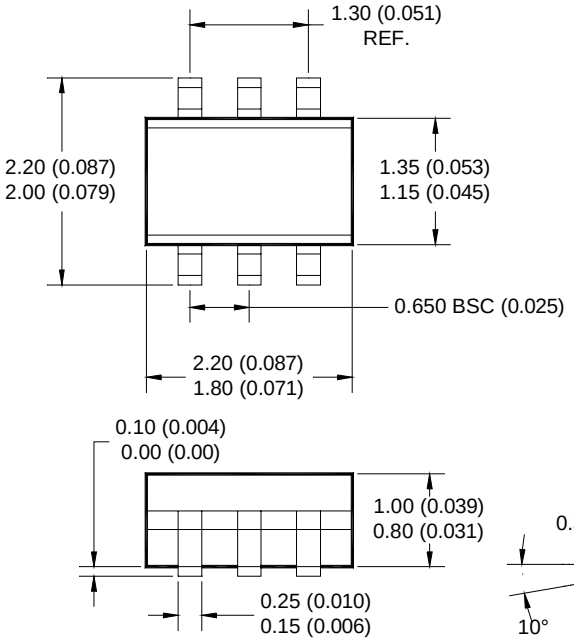
Package Marking



Pin Designation	
1	GND
2	GND
3	RF in
4	Vcc
5	GND
6	RF out

Note: Pin 1 is on lower left when you can read package marking

Package Dimensions



Pad Layout